AV-3G-XMUX
User Manual

Revision: B

2015-04-07

Contents

1 Nevion Support **5**

2 Revision History **6**

3 Product Overview **7**

3.1 Summary 7

4 Introduction **8**

4.1 Extra 3G functions 8

4.1.1 Large mode 8

4.2 Signal flow 9

4.3 Asynchronous data transport 9

4.3.1 De-embedding 9

4.3.2 Embedding 10

4.4 Audio output muting 10

4.5 Top view 10

5 Specifications **11**

5.1 SD HD and 3G SDI 11

5.1.1 Error detection 11

5.1.2 Optical input-PIN 11

5.1.3 Optical laser 13T 12

5.1.4 Optical lasers 13T, 15T, CxxxxT 12

5.1.5 Optical lasers Dxxxx 12

5.2 AES3 audio 12

5.2.1 C1 backplane 13

5.2.2 C2 and C3 backplanes 13

5.2.3 AAV-3G-XMUX-C2 backplane (with one of the AES8 audio converters) 13

5.3 Asynchronous Data 13

5.3.1 Packet or UART mode 14

5.3.2 GPI mode 14

5.3.3 Connector 14

5.4 GPI input/alarms 14

5.5 Latencies 14

5.5.1 SD 15

5.5.2 HD/3G 15

6 Configuration 16

6.1 DIP switch routing 17
6.1.1 AES direction/destination selection 18
6.1.2 Routing 19
6.1.3 Assigning the audio generator 20
6.2 Other DIP Switches 20
6.2.1 DIP config mode SW3.1 20
6.2.2 DMUX LED mode, SW3.2 20
6.2.3 3G High group mode SW3.3 20
6.2.4 Disable SRCs, SW3.4 21
6.2.5 Group remove, SW3.5 21
6.2.6 Fallback generator control, SW3.6 22
6.2.7 EDH insert, SW3.7 22
6.2.8 24 bit (SD), SW3.7 22
6.3 DIP configuration examples 22
6.4 Multicon GYDA 24
6.4.1 Web interface 24
6.4.2 Video input switching 24
6.4.3 Video generator 25
6.4.4 Signal integrity 27
6.4.5 Transport and shuffling of audio groups 28
6.4.6 Audio generator 28
6.4.7 Mono Audio Shuffler 28
6.4.8 Label generator 29
6.4.8.1 Time code auto display 29
6.4.9 RS422 Data port configuration 30
6.4.9.1 Data transmission 30
6.4.9.2 Data latencies 31
6.4.9.3 Embedding 31
6.4.9.4 De-embedding 32
6.4.9.5 Limitations 32

7 Connections 33

7.1 AV-3G-XMUX-C1 33

7.2 AV-3G-XMUX-C2 33
7.3 AV-3G-XMUX-C3 34
7.4 DB-25 34
7.5 Modular jack 8P8C 35

8 LEDs 36

8.1 Status LED 36
8.2 SDT Input LED 36
8.3 AES LEDs 36

9 GPI alarms 38

9.1 Laser kill GPI3 input 38

10 General environmental requirements 39

11 Product Warranty 40

A Materials declaration and recycling information 41

A.1 Materials declaration 41
A.2 Recycling information 41

1 Nevion Support

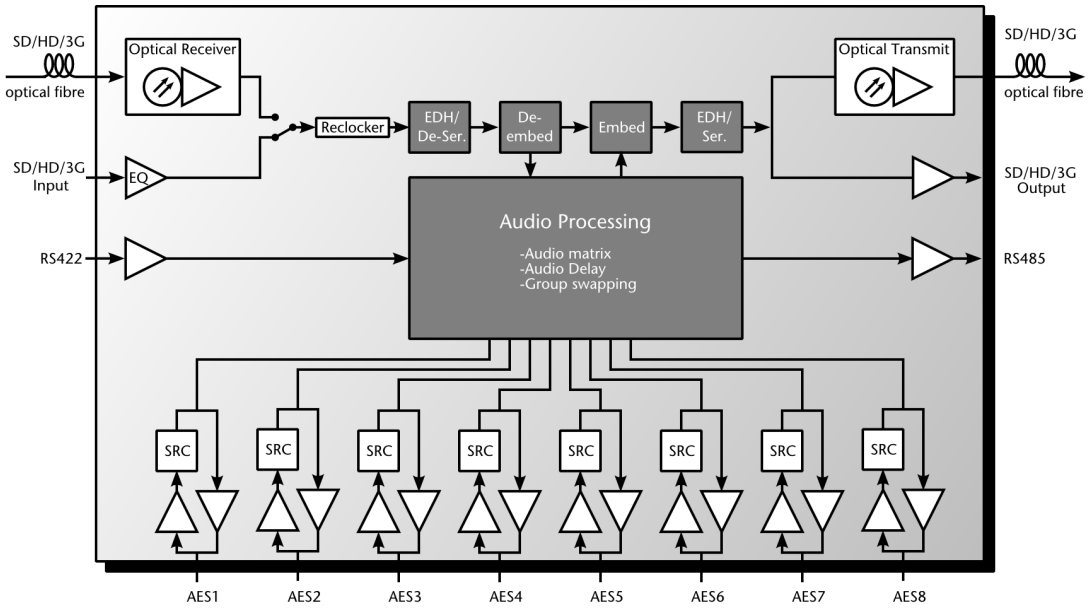
Nevion Europe	Nevion USA
Nevion Europe P.O. Box 1020 3204 Sandefjord, Norway	Nevion USA 1600 Emerson Avenue Oxnard, CA 93033, USA
Support phone 1: +47 33 48 99 97 Support phone 2: +47 90 60 99 99	Toll free North America: (866) 515-0811 Outside North America: +1 (805) 247-8560

E-mail: support@nevion.com
See http://www.nevion.com/support/ for service hours for customer support globally.

2 Revision History

Rev.	Date	Comments
B	2015-03-02	Removed mixer references. Added reference to the mono shuffler block. TMLed. Added Multicon figures.
1	2011-10-20	Changed optical overload.
0	2011-08-25	First revision

3 Product Overview



3.1 Summary

- SD, HD and 3D digital uncompressed video.
- De-embed and embed all groups of audio.
- Copy or move audio groups without additional delay.
- De-embed 8 AES3 digital audio and non-audio signals.
- Embed 8 AES3 digital audio and non-audio signals.
- Applies sample rate converters on the AES inputs when needed.
- Mono shuffle four signals.
- Optical laser output options, including CWDM and DWDM.
- Optical input option.
- Transport of asynchronous serial data.
- Generates video and audio signals including on screen label generator.
- De-glitches correctly synchronized switched video.

4 Introduction

The AV-3G-XMUX is a highly integrated audio embedding module in the Flashlink range, offering simultaneous embedding and de-embedding of eight AES3 stereo digital audio channels from a digital 3G, HD or SD serial video signal.

The module has two main processing blocks. One processes the video stream and the packet data, the other processes the audio. The packet processing core forms a group router which can route embedded audio between groups without any extra delay.

The AV-3G-XMUX audio core is an AES3 audio router. The received embedded audio and the AES3 inputs are the sources in the router. The embedded output groups and AES3 outputs are the destinations. This feature may be used to perform stereo channel swapping.

A mono shuffler is integrated into the stereo router. The sources to the shuffler are the same sources as in the stereo router. The outputs from the shuffler provide four extra stereo sources in the audio router. Each shuffler output has a configurable delay up to 1.37s.

There are 8 AES ports and each may be used as either an input or an output. The sample rate converters may be inserted by the module when needed, or the user can disable them. Data signals such as Dolby E will always be embedded transparently without using the sample rate converters.

All embedding and de-embedding is with synchronous 48 kHz audio.

The unit may be ordered with optical transmitter and receiver options. The laser options range from the standard -7.5dBm 1310nm to the DWDM units. The receiver may be PIN.

The module has signal generators for audio and video for test and line-up applications. The internal video generator may be used as a fall-back source that is used if the both the electrical and the optical input signals fail. This allows uninterrupted transmission of embedded audio.

4.1 Extra 3G functions

AV-3G-XMUX will process the extra 8 audio pairs in 3G SDI.

The module has two different user interfaces in the Gyda System Controller. The 'Large mode' is used if the additional audio in the 3G video signals are to be used.

The 'small' mode represents the module in a similar way to the other Nevion XMUX embedders and only shows the traditional audio groups 1 to 4. The other 3G audio groups are still transported through the module.

4.1.1 Large mode

This functionality should be enabled if the user needs access to the audio in groups 5 to 8 in layer A video OR audio in the second link of Layer B video.

In 'Large mode' the module can still only embed 4 audio groups: Either the conventional 4 groups or the four additional groups in 3G video.

All 8 audio groups are de-embedded from 3G video both in layer A and layer B. The audio signals are available in the audio matrix which is considerably expanded in this mode.

The four audio groups that are not embedded by the module will be transported without any delay. This means that the use of the module with different video formats will be predictable. If the module is to be used to embed the extra 3G audio signals then it will transport the normal 4 audio groups transparently. If SD or HD video is then fed to the same embedder, the embedders will be disabled. De-embedding from the normal groups will be performed as before.

4.2 Signal flow

Video may be presented on the optical or electrical inputs. The module will switch to the other input if the module can not lock to a signal. The video is re-clocked and transformed to parallel video. The parallel video goes into a line buffer which is used to de-glitch the video when switched on the correct line. No errors are flagged or produced when the video is switched on the appropriate switching line. All ancillary data, including embedded audio is extracted from the video signal. All the packed data is sent to the group router. The de-embedded audio is sent to the stereo audio cross-point router. The AES audio inputs are initially connected directly to the audio router. Sample rate converters are inserted if there are sample slips or the signal is not a data signal. The use of the sample rate converters may be disabled. See chapter 3. Four of the router sources are from the mono shuffler. Each input may be any of the de-embedded signals or the AES input signals. The audio signal is delayed by a few samples during de-embedding, re-packeting the audio and audio processing. Signals that pass through the stereo audio router will be delayed by a small number of samples. The group router outputs from the de-embedders do not introduce any additional delay as the audio does not require unpacking and re-packing. The embedder core embeds either re-packeted audio from the stereo router or the existing de-embedded audio as configured in the group router. The embedded audio packets are inserted into the video signal together with the control packets and any other packets that were present in the original video signal. The video is serialized and output through the cable and laser drivers. The AES audio output signals are taken from outputs of the audio router.

4.3 Asynchronous data transport

Data signals are transported using the user (U) bits in AES audio streams. The de-embedding and embedding is performed in the AES audio router core. Any input in the router core may be chosen for data de-embedding and any router output may be used to embed data. See section 3.5.

4.3.1 De-embedding

The module receives many AES signals and data may be present on any of them. The user must configure which AES signal the data is expected to be on. The status page in GYDA will show the presence and the type of data detected on the configured channel. De-embedded data is output on the RS485 backplane output.

4.3.2 Embedding

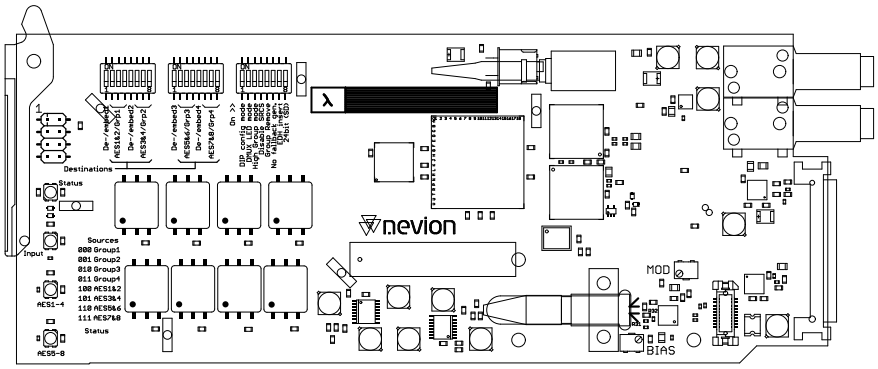
Two things must be configured for embedding data.

1. The data format to be received on the backplane connector.
2. The audio signal(s) to embed data into. The channel status (C) bits of the channels are also overwritten.

4.4 Audio output muting

The AES ports used as outputs may be completely switched off when the upstream source is absent. This may be used to trigger an alarm or changeover. The 'automute' setting must be activated for this to work and the upstream embedder must be one of the Nevion XMUX embedders. The activity bits in the audio control packets are used to convey this information along with the video.

4.5 Top view



5 Specifications

5.1 SD HD and 3G SDI

One electrical input and one electrical output. One optical input and one optical output available as options. Optical range depends on the output power of the transmitter and the sensitivity of the receiver of the next module.

Table 5.1 Video Standards

Video standards	ITU-R BT.665 SMPTE S292 and S425 level A and B
Embedded audio	SMPTE S272, S299(1+2:2010)
Standards not supported	1250 line SMPTE 295M

5.1.1 Error detection

- Input video lock (Active overrides all other error flags)
- Incorrect format framing (TRS)
- EDH according to SMPTE RP165
- Line CRC and TRS errors
- Ancillary packet checksum errors
- Number of audio samples per line and frame

All SDI parameters conform to the relevant standard, ITU-R BT.656, SMPTE S292, S425.

5.1.2 Optical input-PIN

Optical wavelength	1200-1620nm ±40 nm
Maximum Optical power	SD/HD: -3 dBm, 3G: -5 dBm
Sensitivity SD/ HD /3G	-25/ -20/ -17 dBm
Return loss	Better than 27 dB.
Maximum reflected power	4%
Transmission circuit fiber	Single mode
Connector	SC/UPC

5.1.3 Optical laser 13T

Transmission circuit fiber	9/125um Single Mode
Connector	SC/UPC
Optical wavelength	1310nm ±40nm
Light source	FP semiconductor laser
Optical power	-5 dBm
Extinction ratio	>5:1

5.1.4 Optical lasers 13T, 15T, CxxxxT

Transmission circuit fiber	9/125um Single Mode
Connector	SC/UPC
Optical wavelengths	1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610nm ±6nm
Light source	DFB semiconductor laser
Optical power	0 dBm
Extinction ratio	>8:1

5.1.5 Optical lasers Dxxxx

Transmission circuit fiber	9/125um Single Mode
Connector	SC/UPC
Optical wavelengths	ITU G694.1 100GHz raster
Light source	DFB semiconductor laser
Optical power	0 or +3 dBm
Extinction ratio	>10:1

5.2 AES3 audio

8 ports individually assignable as inputs or outputs. Number of ports and physical connections are dependant on the backplane option selected. The standard connector backplane is the AV-3G-XMUX-C1

Inputs and outputs according to	AES3-2003
Minimum sampling frequency	30 kHz
Maximum sampling frequency	100 kHz
Embedded audio word length	24 bits
Embedded audio Channel status	As received when isochronous, otherwise fixed
Sample rate converter dynamic range	139 dB(A) @ 1 kHz
Mono shuffler maximum delay	1.37 s

5.2.1 C1 backplane

Impedance	110 ohm transformer balanced
Connector	25 pin D-sub
Number of ports	8

5.2.2 C2 and C3 backplanes

Impedance	75 ohm unbalanced
Connector	BNC
Number of ports C2	8
Number of ports C3	4

5.2.3 AAV-3G-XMUX-C2 backplane (with one of the AES8 audio converters)

Impedance	110 ohm transformer balanced
Connector	15 pin D-sub
Number of ports	8

5.3 Asynchronous Data

Embedded into the User bits in one of the embedded audio channels.

5.3.1 Packet or UART mode

Baud rates	9600 to 115200
Data length	7 or 8 bits
Parity	None, odd or even
Stop bits	1, 1.5 or 2 bits

5.3.2 GPI mode

Raw data sampling frequency	93750 Hz

5.3.3 Connector

Input standard	RS422
Packet mode output standard	RS485
GPI mode output standard	RS422
Connector	8P8C Modular jack (RJ45)

5.4 GPI input/alarms

Status good alarm is active (low impedance to ground) when module is operating normally. Laser failure alarm may also be used as a laser kill input.

Input	Laser kill (active ground)
Alarms	Status good, no video input lock, laser failure.
Connector	8P8C Modular jack (RJ45)
Signal type	Open drain transistor with free-wheel diode.
Maximum voltage	100 V
Maximum current	150 mA

5.5 Latencies

Video latency is variable due to the de-glitcher but the values below apply when the video signal is first applied. Other latency values are maximum values.

5.5.1 SD

Video	45.3us
Audio embedding	417us
Audio de-embedding	438us
Embedding GPI mode	458us
Embedding UART mode	2.01ms
De-embedding GPI mode	458us
De-embedding UART mode	458us

5.5.2 HD/3G

Video	427.6us
Audio embedding	250us
Audio de-embedding	229us
Embedding GPI mode	292us
Embedding UART mode	1.84ms
De-embedding GPI mode	292us
De-embedding UART mode	292us

6 Configuration

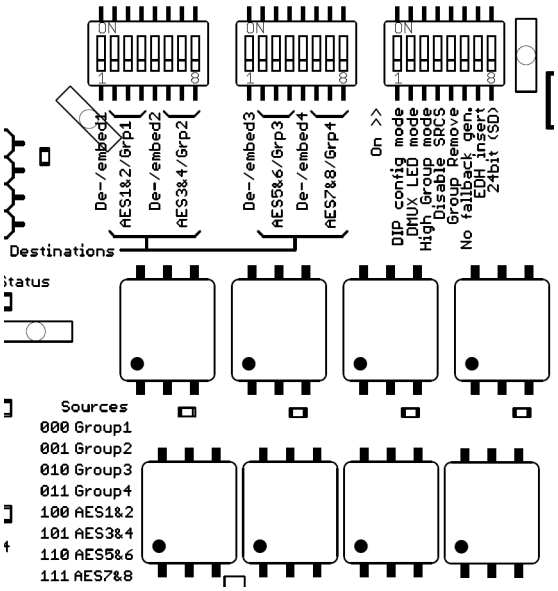


Figure 6.1 Module DIP switches.

The XMUX embedding core has five main configuration elements.

1. Operating mode.
2. 8 AES ports which may be used as outputs or inputs.
3. 30x16 stereo audio router.
4. 4x4 group router.
5. 8 channel mono shuffler.

The AV-3G-XMUX has two main operating modes.

- Small: Traditional 4 audio group embedder. Embedding and de-embedding of audio groups 1 to 4. Extra 3G audio groups in a signal will still be transported.
- Large: Access and configuration of extra 3G audio groups. De-embedding of all 8 groups. Embed to either groups 1 to 4 OR groups 5 to 8. The non-embedded groups are always transported.

The inputs or sources in the stereo router are from the de-embedded audio groups, the AES inputs, the shuffler outputs and the two built in generators. The stereo router outputs or destinations are the groups of embedded audio in the output video and the AES outputs.

The group router is used to transport or shuffle groups without introducing any additional delay. A normal de-embedder configuration would route the de-embedded audio to the AES outputs. A

normal embedder configuration would be to route the AES inputs to the appropriate embedder group outputs.

The AV-3G-XMUX module can do both at the same time!

Many other configurations are possible and the module may be dynamically controlled as a 32x16 audio router via the system controller, GYDA.

Full control of the module is performed with the GYDA system controller. Controls *only* possible with GYDA are:

- The data transmission parameters and channel selection.
- The delay lines delays and routing to and from the shuffler.
- Video and audio generator configuration.
- Audio mono shuffler configuration.
- Full audio router control

Note: The three switches SW3.1-3 are always used. The other switches are only used if SW3.1 is on.

6.1 DIP switch routing

The DIP switches are only read during the power-up process.

Full hardware control of all of the parameters in the module would require either, a complicated menu type of control interface with a display and control buttons; or an enormous number of switches. In many cases, most of the parameters will not be changed from the default settings. It was decided to control only the most used parameters with switches covering the most used configurations. This still requires the use of 24 switches.

There are not enough switches on the module to allow full stereo routing configurations. Groups of four channels are routed together as units, for example: AES channels 1&2, embedded audio group 1.

The routing is controlled with the two first DIP switch blocks SW1 and SW2 which are at the top of the module, closest to the handle. Each routing set is controlled with four switches, 1 switch controlling the direction/destination, and 3 switches for the routing. The other configuration options are set in the third DIP switch block.

6.1.1 AES direction/destination selection

The 1st switch in each set of 4 controls **two** things:

1. The *direction* for 2 AES ports
2. The routing destination for the 3 switches.

Up or on means:

- The AES ports are inputs.
- The routing selects the source for an embedder group.

Down or off means:

- That the AES ports are outputs.
- The routing selects the source for AES outputs.

For Example: When SW1 switch 1 is ON:

- The module will embed into group 1 and AES 1&2 are inputs.
- The next three switches 2, 3 and 4 control which source will be embedded into group 1.

If SW1 switch 1 is OFF:

- The module will NOT embed group 1 and AES 1&2 are outputs.
- The next three switches 2, 3 and 4 control which source will be routed to AES outputs 1&2.

This pattern applies to all the switches of SW1 and SW2.

Table 6.1 SW1

1	2-4 route to	5	6-8 route to
ON	Emb Group 1	ON	Emb Group 2
OFF	AES 1&2	OFF	AES 3&4

Table 6.2 SW2

1	2-4 route to	5	6-8 route to
ON	Emb Group 3	ON	Emb Group 4
OFF	AES 5&6	OFF	AES 7&8

Switches 1 and 5 control **two** things. The tables show how they effect the next two switches

This system reduces the number of switches needed to set up the most popular configurations. E.g.

- A dedicated embedder would use AES ports as inputs so all 4 of the direction switches would be ON. The routing switches would then be controlling the routing to the audio groups.
- A deembedder would would use AES ports as outputs so all 4 of the direction switches would be OFF. The routing switches would then be controlling the routing to the AES outputs.

6.1.2 Routing

The 3 switches set the source for that destination.

There are eight possible permutations of the switches. Up is 1, down is 0.

Note: The group numbers are 5 to 8 if the module is set up for the high audio groups.

Switch #	2 or 6	3 or 7	4 or 8
De-embedded Group 1	0	0	0
De-embedded Group 2	0	0	1
De-embedded Group 3	0	1	0
De-embedded Group 4	0	1	1
AES inputs 1 & 2	1	0	0
AES inputs 3 & 4	1	0	1
AES inputs 5 & 6	1	1	0
AES inputs 7 & 8	1	1	1

The AES ports which are configured as outputs are not available as sources. If the source is the same as the destination, the audio generator will be the source. Other invalid routing will use a muted signal as the source. This table is reproduced on the module.

Note: Groups may be 1-4 OR 5-8.
The position of the DIP SW3.3 'High Group Mode' controls the Group numbers. Both the group sources and group destinations are changed if the switches SW3.3 & SW3.1 are on. In this case, the groups will be the extra audio groups in 3G video and all conventional audio groups will pass through the module.

6.1.3 Assigning the audio generator

It is assumed that the hardware switches will be used when the configurations are relatively straightforward but there are times when it is useful to use the internal tone generator as a source. This may be done by routing the destination to the corresponding direct source Examples.

1. embedder 1 from de-embedder 1.
2. AES 1&2 from AES 1&2 (also not possible).

This is not very intuitive and is mostly meant as an engineering debugging aid.

6.2 Other DIP Switches

Remember, the switch settings are only read when the module is powered up.

Note: The three switches SW3.1-3 are always used. The other switches are only used if SW3.1 is on.

6.2.1 DIP config mode SW3.1

SW3.1 on, the DIP switch configuration is used. If there is a GYDA present, the switch configuration on the module will also overwrite the configuration stored in the GYDA controller.

SW3.1 off, will not use the DIP switches for routing. The module will be configured from either the stored configuration in the module or from GYDA if there is GYDA present. The configuration is stored when a GYDA configuration command is used. Therefore if a GYDA is present, the internal configuration may be overwritten by the GYDA controller.

The DIP switches control the routing and a couple of other important settings. Other stored settings, such as data embedding audio shuffler and generator settings will always be used.

6.2.2 DMUX LED mode, SW3.2

The switch controls how the two audio LEDs function. If the switch is off, the LEDs show the AES status. The LED indicates input signals if the ports are used as inputs and output signal presence if the ports are outputs. If the switch is on, the LEDs show the presence of embedded groups.

The LEDs can be red, orange and green. Red indicates that none of the signals are present. Green indicates that all of the signals are present. Orange indicates that some of the signals are present.

6.2.3 3G High group mode SW3.3

The embedders may be used as a normal 4 group embedder with all video formats OR it may be used to embed the extra audio groups available in 3G video formats. The groups numbered 5 - 8 in layer A video or the audio groups 1 - 4 in the second stream of a dual link signal are regarded equivalent by the module. Group 5 in the user interface will be group 5 of layer A 3G video or group 1 in the second stream of a layer B signal.

If SW3.1(DIP config mode) is ON & SW3.3 (High group mode) is ON:-

- All DIP switches are used for configuration.
- GYDA will only be able to monitor the card.
- All group numbers for the DIP routing configuration will refer to the extra 3G audio groups. All the conventional embedded audio will pass through the module.

If SW3.1(DIP config mode) is ON & SW3.3 (High group mode) is OFF:-

- All DIP switches are used for configuration.
- GYDA will only be able to monitor the card.
- The extra 3G audio embedded audio will pass through the module.

If SW3.1(DIP config mode) is OFF & SW3.3 (High group mode) is ON:-

- The card is to be controlled by GYDA or the stored configuration is to be used.
- The embedder mode may be either high or low groups. This is set in the configuration page of GYDA.
- De-embedded audio from all 8 groups may be routed in the audio router.
- All the conventional embedded audio will pass through the module.

If SW3.1(DIP config mode) is OFF & SW3.3 (High group mode) is OFF:-

- The card is to be controlled by GYDA or the stored configuration is to be used.
- De-embedded audio from the conventional 4 groups may be routed in the audio router.
- The extra 3G audio embedded audio will pass through the module.

6.2.4 Disable SRCs, SW3.4

The sample rate converters will not be used if this switch is on. The user must ensure that the AES input signals are locked to the video signal otherwise click noises will be produced in the embedded audio signals.

If the switch is off, the sample rate converters will be used when necessary.

6.2.5 Group remove, SW3.5

This switch controls whether existing embedded audio is re-embedded or removed.

When SW3.2 is on, the output video will only contain audio embedded by the module.

When SW3.2 is off, all existing embedded audio groups will be transported unless overwritten.

3G audio groups which are not handled by the module will always be transported.

6.2.6 Fallback generator control, SW3.6

This switch is used to control the outputs when the input signals are not present.

On: The Video output will be disabled if the input signal is removed. The AES outputs will be disabled if the source routed to that output is not present. The input presence of the AES signals is embedded in the embedded audio data packet so that an upstream AES input failure will disable an AES output which uses that embedded audio. To summarize: An AES input at an embedder input will control the muting at the output of the de-embedder.

Off: The internal video generator will be used as an input until a valid video signal is detected on one of the inputs. The AES outputs will always be on but the signal will be silent if the source is absent.

6.2.7 EDH insert, SW3.7

SD video output from the module will contain an EDH packet if this switch is on.

6.2.8 24 bit (SD), SW3.7

SD video will contain embedded audio with a word length of 24 bits if the switch is on.

SD video will contain embedded audio with a word length of 20 bits if the switch is off.

3G/HD video will always contain embedded audio with a word length of 24 bits.

6.3 DIP configuration examples

Routing by the DIP switches is easy if all the AES port directions are the same.

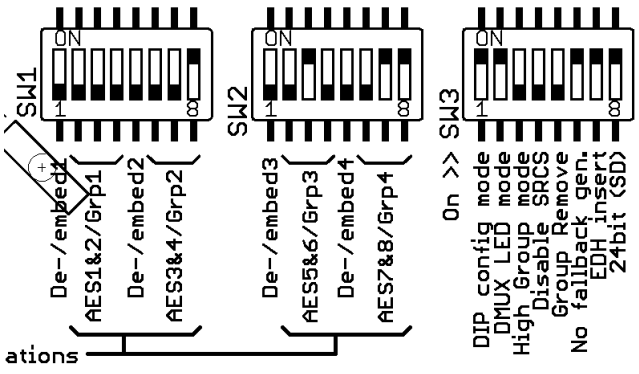


Figure 6.2 : Example 1

The module above is set to de-embed all 4 audio groups. Each AES pair is set to each of the 4 groups.

The front panel LEDs will show the presence of audio groups in the received video signal.

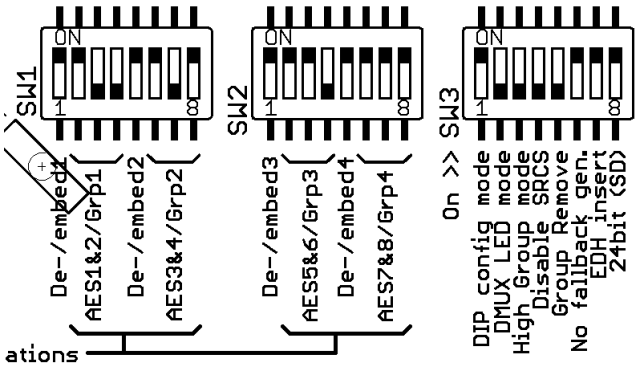


Figure 6.3 : Example 2

The module above is set to embed all 4 audio groups. Each embedder group takes signals from the different AES pairs.

The front panel LEDs will show the presence of audio on the AES inputs.

It becomes more complicated if complex routing is required because the embedding of each group can only be done in one place.

e.g. embed group1 can only be controlled with SW1.1-4. Route these first then use the unused switches to set up the de-embedding.

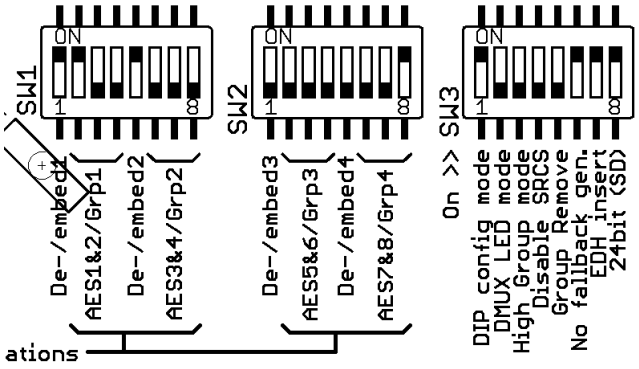


Figure 6.4 : Example 3

The module above is set to:-

- Embed group 1 from AES 1 & 2.
- Embed group 2 with de-embedded group 1. ie move group 1 to 2.
- De-embed groups 1 to AES 5 & 6 and group 2 to AES 7 & 8.

6.4 Multicon GYDA

Multicon GYDA is the system controller for the Flashlink frames. The Controller itself is inserted into one of the Flashlink frame slots where it communicates with the cards in that frame. Up to 8 frames may be connected together with standard CAT-5 cables. Each frame must then be assigned an address with the DIP switch on the power connector backplane. The Controller card has an ethernet connector which may be connected to a TCP/IP network. The controller presents the Flashlink system as an SNMP server and an html webserver.

Full control of the web GUI is possible with the GYDA system controller if the DIP switch SW3.1 is off. The module stores its configuration in non-volatile memory when a GYDA command is given. This allows a complex configuration to be restored after a power loss. GYDA also stores the configuration of all the modules it controls. GYDA uses this to restore the configuration of a module if it is hot-swapped. This hot-swap re-configuration only occurs if the module is removed from a running system with an active GYDA. Modules that are hot-swapped must also be of the same type.

Note: AV-3G-XMUX reports one of two types to GYDA depending on the position of SW3.3 (Large mode). Off -> AV-3G-XMUX: On -> AV-3G-XL-MUX.

SW3.3 must have the same setting for the modules involved in a hot-swap.

6.4.1 Web interface

The main page is different for the 'Small' and 'Large' modes.

The graphic also changes according to the embedding mode: low groups (1 - 4), or high groups (5 - 8).

The many configurable parameters and alarms makes a very long configuration page. There are three figures following to show all of the elements. Not all the elements will be present in 'small' mode.

6.4.2 Video input switching

The default mode of operation is auto-switch between the optical and electrical inputs when the optical input is present. The module may be configured to either use the internal generator, or to switch off when no video is detected on the inputs. The video generator may be selected to override the input video picture. The input video will decide the timing of the output video and any embedded packets will still be used by the module. Only the picture will be overwritten. Upstream video switching will cause glitches in the digital video. The module will remove these glitches if the switch occurs on the correct video line for the standard in use. The input buffer is two video lines of the longest standard and starts in the middle. Subsequent switches will be transparent if the new signal is within a line from the original video. There will be a glitch on the output if the new video phase is outside of this range. The buffer will be re-aligned to the middle with the new signal phase.

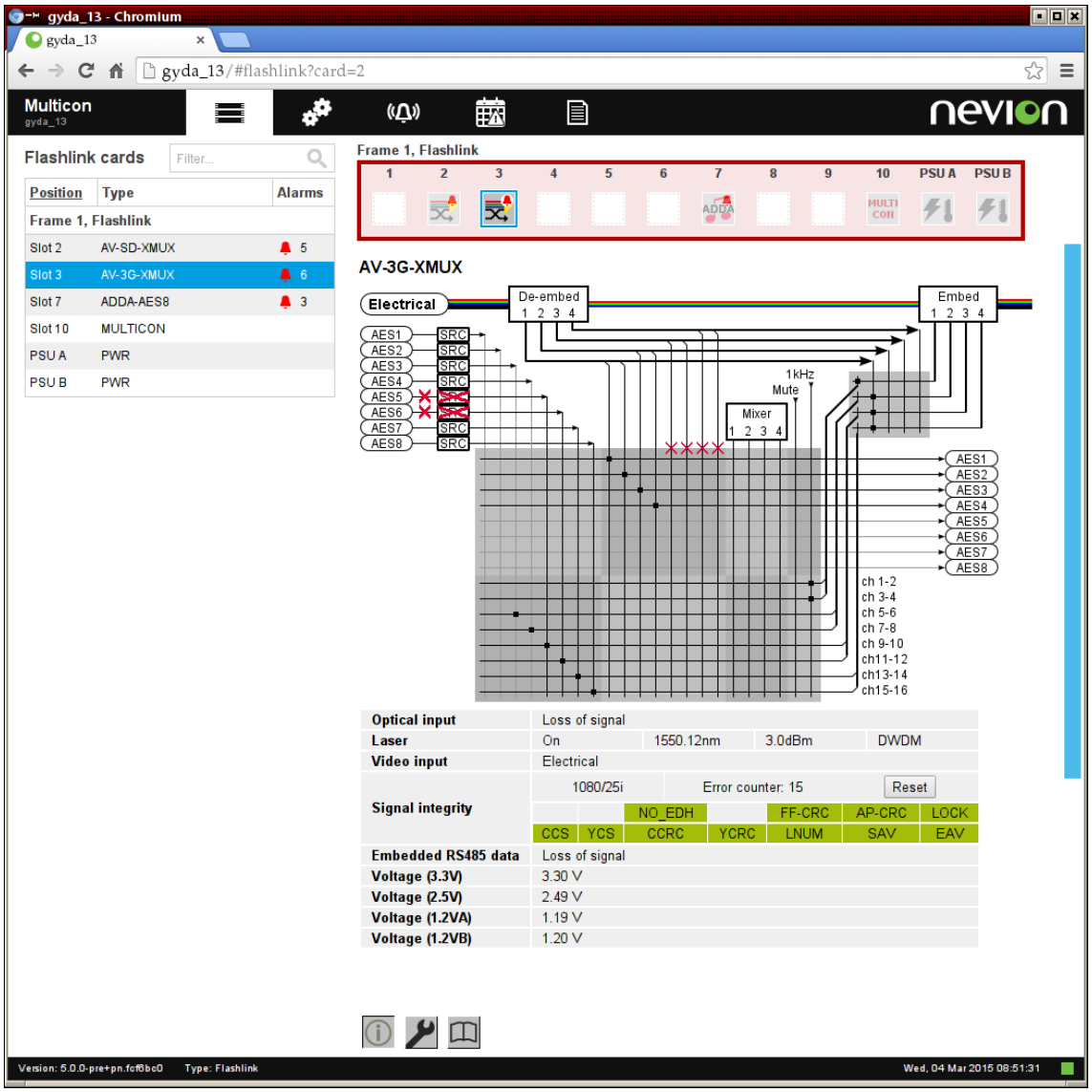


Figure 6.5 Info page, Small mode

6.4.3 Video generator

The video generator has several simple signals: Red, Green, Blue or Black full field. Color bar, 100% white, 75% colors, no set-up level. Color bar as above with moving black rectangle. The black rectangle turns to grey when the left audio tone is muted every 3 seconds. This may be used to help adjust timing errors between audio and video. The video format of the generator may be set if there is no video signal present at either of the video inputs. The generator may also be set to 'On LOS', 'Always' and 'Never'.

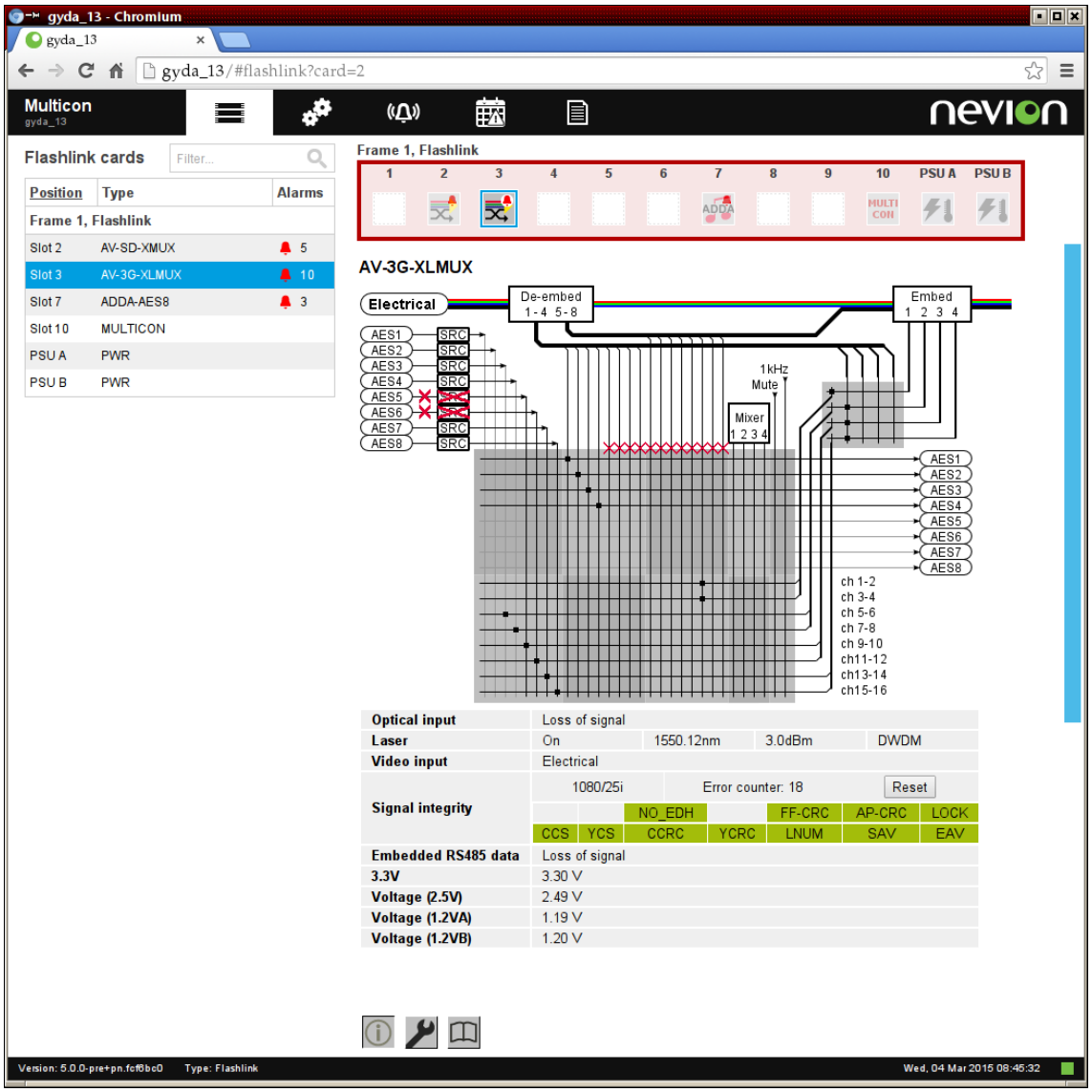


Figure 6.6 Info page, Large mode, low groups

- The 'On LOS' setting enables the generator if there are no valid video inputs detected (LOS = Loss Of Signal).
- The 'Always' setting will override the input video signal but the output will be synchronised to the video input.
- The 'Never' setting will disable the video output if there are no valid video inputs detected.

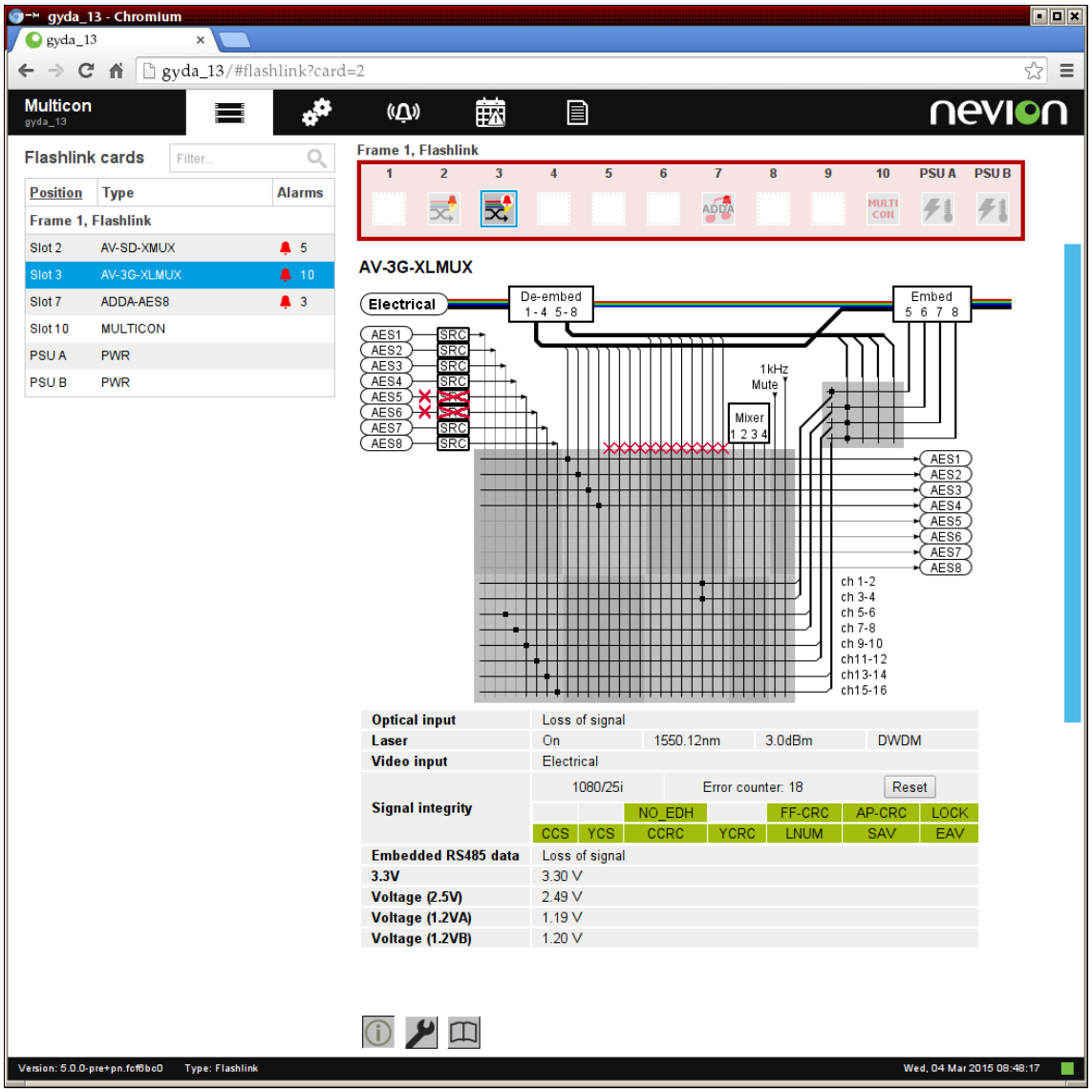


Figure 6.7 Info page, Large mode, high groups

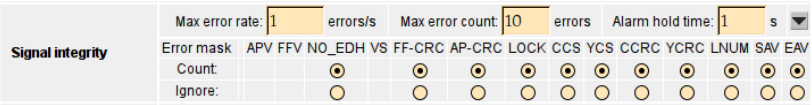
6.4.4 Signal integrity

The input video is checked for several different parameters. The different parameters that are monitored are the following:-

The error counter counts the number of video frames with errors. The Colour blocks on the main page are green if the error type is not detected and red if it is detected. The block has the background colour if the error is masked using the drop-down config gui at the right of the Signal integrity section on the configuration page.

The time and error count boxes affect the number of errors reported to the log and SNMP. They are configured from the factory to be very slow.

LOCK	Video input loss of signal
EAV,	SAV Video frame format TRS errors
YCS, CCS	Ancillary data packet checksum errors
YCRC, CCRC	HD line CRC errors
LNUM	HD line number errors
NOEDH	SD EDH packet presence
FF-CRC	SD EDH packet Full frame CRC errors
AP-CRC	SD EDH packet Active picture CRC errors


Signal integrity
Max error rate: 1 errors/s
Max error count: 10 errors
Alarm hold time: 1 s
Error mask APV FFV NO_EDH VS FF-CRC AP-CRC LOCK CCS YCS CCRC YCRC LNUM SAV EAV
Count:
Ignore:

6.4.5 Transport and shuffling of audio groups

The AV-3G-XMUX stereo audio router involves de-embedding, buffering and re-embedding which introduces a small delay relative to the video signal. The group router is used to avoid this extra delay. Groups that only pass through the group router are re-embedded in the same video line. This avoids any extra delay and means that incompatible audio formats (asynchronous audio/ 96 kHz audio) may still be transported. The AV-3G-XMUX automatically uses transport mode whenever possible when controlled with the DIP switches. *Shuffling* of groups is when existing embedded audio groups are re-assigned to different groups. Copying of groups is also possible i.e. Group 1 may be transported to Group 1 and duplicated to Group 2. This function also takes place in the group router which means that there is no extra delay. There are 8 possible groups with 3G video but the AV-3G-XMUX has only 4 embedders so the group routing is only possible on either the low conventional groups or the high 3G groups.

6.4.6 Audio generator

The stereo audio generator is available in the audio router as a source. It is a high purity 1 kHz sine wave with a 250ms interruption on the left channel every 3 seconds. The audio level may be set to one of two standards. The two levels are -18 dBFS and -20 dBFS. These two levels correspond to EBU R68 and SMPTE RP 155.

6.4.7 Mono Audio Shuffler

The audio shuffler is shown in the main GUI as the rectangle labelled 'Mixer'. It has four stereo outputs which may be delayed as set with the delay controls. The shuffler inputs are mono so each if the eight inputs may be independantly set with a drop down from any of the mono channels in the main stereo matrix except the two audio generators.

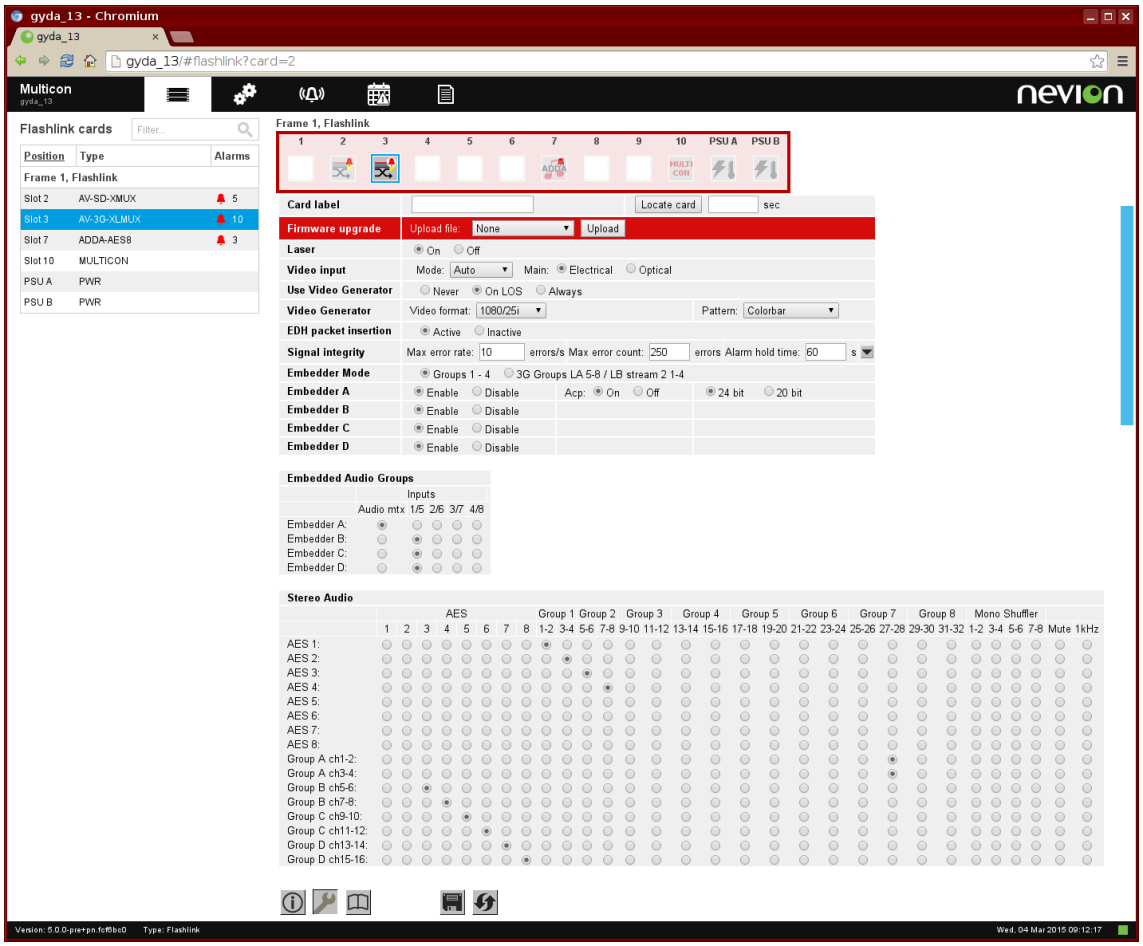


Figure 6.8 Config page top

6.4.8 Label generator

The module has a label generator which has to styles.

- Label: generate up to two lines of 16 characters.
- Time code: burn in ATC time code

The generator may be set to Enable, Disable or Auto. The Auto setting switches the label on when the video generator is active. The actual label text may be changed by clicking the small grey triangle at the right end of the section.

6.4.8.1 Time code auto display

The auto setting has a special usage as the time code is not visible when video is present. The time code reader is still active and the value displayed when the input video is removed, is the last seen time code.

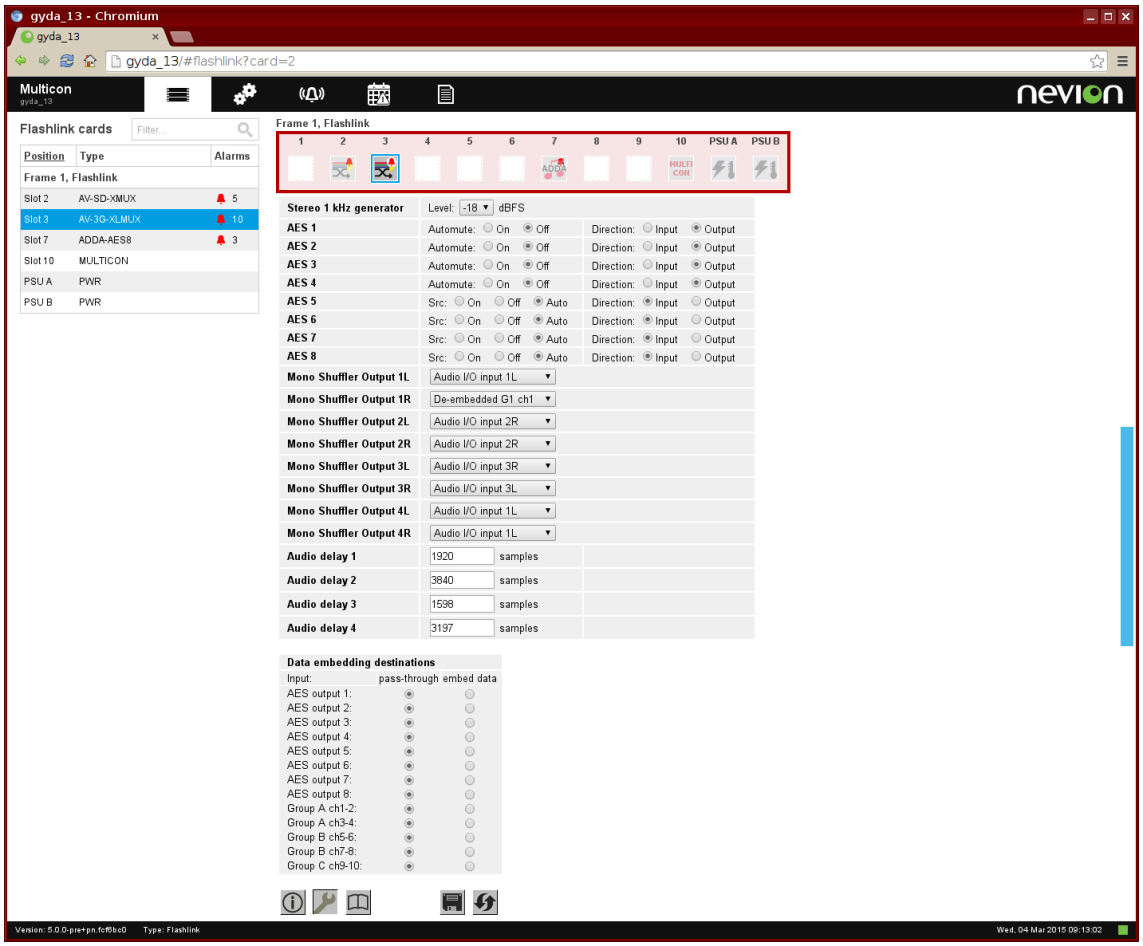


Figure 6.9 Config page middle

6.4.9 RS422 Data port configuration

The RS422 data backplane input must be configured with GYDA. The baud rate, data length, parity and stop bits must be configured if UART mode is used. The router destination where the data is to be embedded must be set up and the source channel containing the received data that will be output on the backplane must be also be configured. See the next section

6.4.9.1 Data transmission

The module can de-embed and embed asynchronous data. An AES3 audio signal, user bit channel is used as a carrier. Both embedded audio and normal AES3 signals may be used to carry the RS422 data. The fiber connection usually only goes one direction so any desired return path must be created by the user with another circuit. Return data may be sent over fiber via a link comprising of XMUX embedders, D422 or D422-MG modules. The return signal may also be carried on a normal copper AES signal. The data input works in one of two modes:

1. UART Mode: The data is checked for correct reception according to the configuration. The data words are packaged and sent when present.

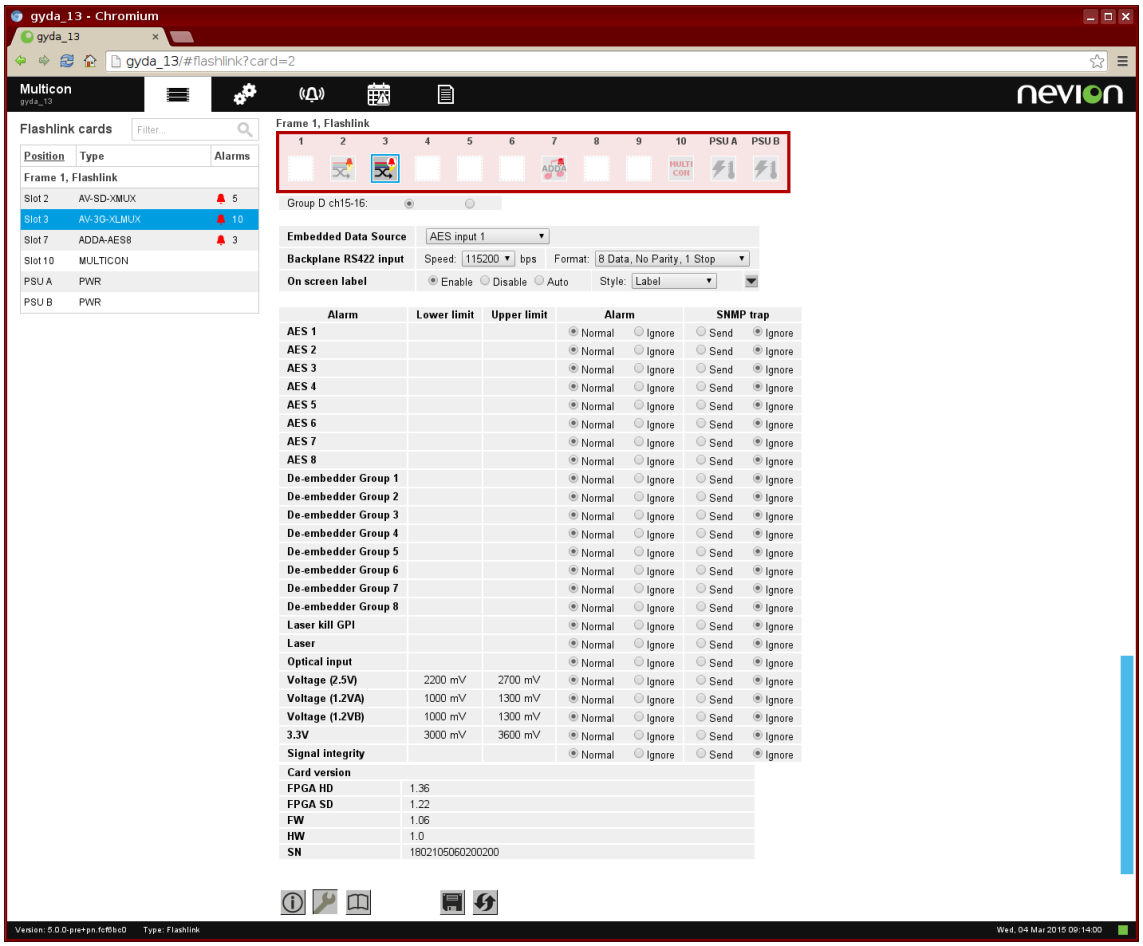


Figure 6.10 Config page bottom

2. Raw sampling mode: The data input is sampled at 93.75 kHz and embedded as a data stream. No checking is performed.

6.4.9.2 Data latencies

The data channel has a total latency of approximately 900us when using raw sampling. Normal data rates of up to 9600 may be used with raw data sampling to have a low latency. The latency is 2.6ms when using the normal data encoding due to the block structure of the AES User bits. The configuration of the data channel is always stored in the module and used regardless of the GYDA override switch.

6.4.9.3 Embedding

The AV-3G-XMUX has a RS422 data input for the embedding of control data. The mode and other parameters are configured with GYDA. The factory default is UART mode, 115200 baud, no parity, and one stop bit. The data channel is encoded in the User bits in an embedded audio stereo signal assigned with GYDA. The factory default is Audio channels 1 & 2 in Group 1.

6.4.9.4 De-embedding

The audio channel with the 'data signal to be de-embedded' must be configured by GYDA as there may be several data channels available. The AV-3G-XMUX will automatically detect the data channel format when present and output the data on the backplane connector. The output driver will only be active when data is output in UART mode i.e. RS485. The output is always active when raw data mode is used.

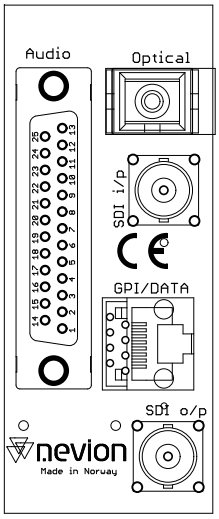
6.4.9.5 Limitations

The normal UART mode checks the data when receiving and only embeds valid bytes. The data format must be correct. This also means that a BREAK condition of many spaces will not be detected or transmitted. Contact support if this is a requirement.

7 Connections

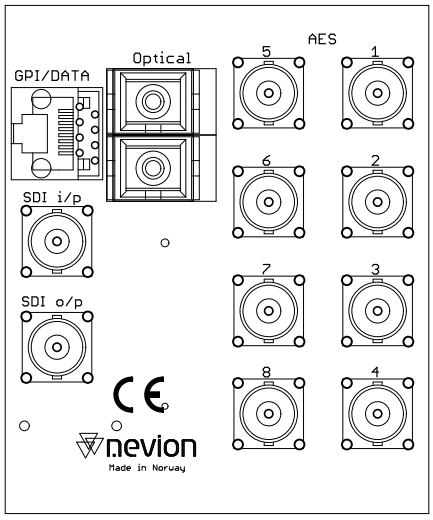
7.1 AV-3G-XMUX-C1

AES ports d-sub25 1-8, BNC SDI and single optical connector



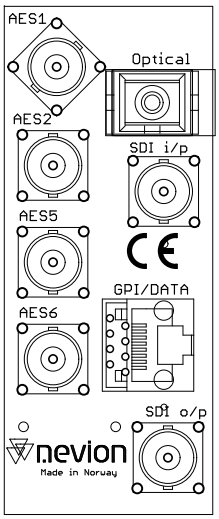
7.2 AV-3G-XMUX-C2

AES ports BNC 1-8, BNC SDI dual optical connectors



7.3 AV-3G-XMUX-C3

AES ports BNC 1,2,5 and 6, BNC SDI single optical connector



7.4 DB-25

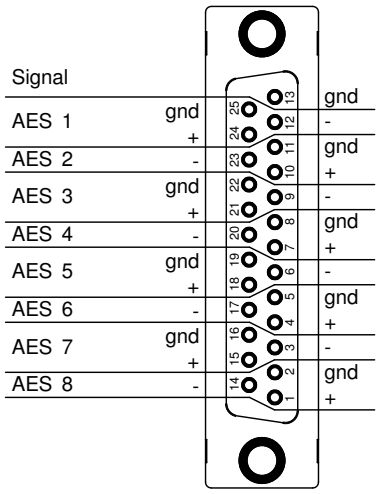


Figure 7.1 The backplanes use the TASCAM standard pin assignment for 8 balanced audio channels on the female DB-25.

The standard backplane supplied with the AV-3G-XMUX is the AV-3G-XMUX-C1.

7.5 Modular jack 8P8C

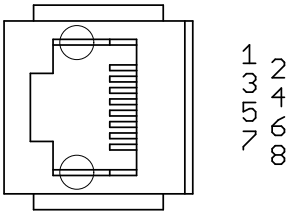


Figure 7.2 GPI / data connector

Pin	Function
1	Status
2	No video signal
3	Laser failure/ Laser kill
4	RS485/422 output +
5	RS485/422 output -
6	RS422 input +
7	RS422 input -
8	Ground

8 LEDs

The module has four LEDs.

8.1 Status LED

This turns red for 1 second when power is applied and then turns green when the FPGA code has loaded correctly.

The LED is green

- the module is programmed and functioning normally.

The LED is orange

- the module is not programmed

The LED is red

- there is something wrong with the module power supply levels OR
- the FPGA code has not loaded correctly OR
- The laser output is not active (failed or killed)

8.2 SDT Input LED

The LED is green

- the SDI signal is received correctly with the optical input

The LED is orange

- the SDI signal is received correctly with the electrical input

The LED is red

- there is no input or the module is unable to lock to the signal.

8.3 AES LEDs

The function of the next two LEDs is determined by the position of DIP SW3.2.

On (De-embed mode)

- The LEDs show the presence of audio groups in the received video signal

Colour	AES1-4 led	AES5-8 led
Red	Group 1&2 absent	Group 3&4 absent
Orange	Group 1 or 2 present	Group 3 or 4 present
Green	Group 1&2 present	Group 3&4 present

Off (Embed mode)

- The LEDs show the presence of AES signals on AES ports

Colour	AES1-4 led	AES5-8 led
Red	AES 1-4 absent	AES 5-8 absent
Orange	Some of AES 1-4 present	Some of AES 5-8 present
Green	AES 1-4 present	AES 5-8 present

9 GPI alarms

Only three alarms are present on the 8P8C jack (RJ45) connector as four of the pins are used for the RS422 data port. The three alarms are:

1. GPI1 Status (negative logic) This alarm will be *inactive* if:-

- The power is not present in the module.
- The FPGA firmware is invalid.
- The DWDM laser option has failed.

1. GPI2 Video signal lost
2. GPI3 Laser failure (DWDM option not fitted)

The alarm signals are open collector transistor switches. An active condition means that the transistor is conducting. The Status alarm should always be active during normal operation.

9.1 Laser kill GPI3 input

GPI3 is used as a GPI input to kill the laser output when the DWDM laser option is fitted. Connection of the pin to 0V will switch off the laser. The pins of several modules may be connected together to kill all of the lasers going into a multiplexer filter.

10 General environmental requirements

The equipment will meet the guaranteed performance specification under the following environmental conditions:

Operating room temperature range	0°C to 45°C
Operating relative humidity range	<90% (non-condensing)

The equipment will operate without damage under the following environmental conditions:

Temperature range	10°C to 55°C
Relative humidity range	<90% (non-condensing)

11 Product Warranty

The warranty terms and conditions for the product(s) covered by this manual follow the General Sales Conditions by Nevion, which are available on the company web site:
http://www.nevion.com

Appendix A Materials declaration and recycling information

A.1 Materials declaration

For product sold into China after 1st March 2007, we comply with the "Administrative Measure on the Control of Pollution by Electronic Information Products". In the first stage of this legislation, content of six hazardous materials has to be declared. The table below shows the required information.

組成名稱 Part Name	Toxic or hazardous substances and elements					
	鉛 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
AV-3G-XMUX	O	O	O	O	O	O
	O	O	O	O	O	O

O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

This is indicated by the product marking:

A.2 Recycling information

Nevion provides assistance to customers and recyclers through our web site: http://www.nevion.com/. Please contact Nevion's Customer Support for assistance with recycling if this site does not show the information you require.
Where it is not possible to return the product to Nevion or its agents for recycling, the following general information may be of assistance:
Before attempting disassembly, ensure the product is completely disconnected from power and

signal connections.
All major parts are marked or labeled to show their material content.
Depending on the date of manufacture, this product may contain lead in solder.
Some circuit boards may contain battery-backed memory devices.